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(54) **Below the car retractable apron**

(57) Apron for use as a safety device in an elevator, said elevator comprising a landing, an elevator shaft, a car and a car floor, which apron (1) can be disposed un-

der the floor (6) of the car (5) in a position parallel to it for normal operation of the elevator and that the apron (1,15) can be brought into a position substantially perpendicular to the floor (6) of the car (5).

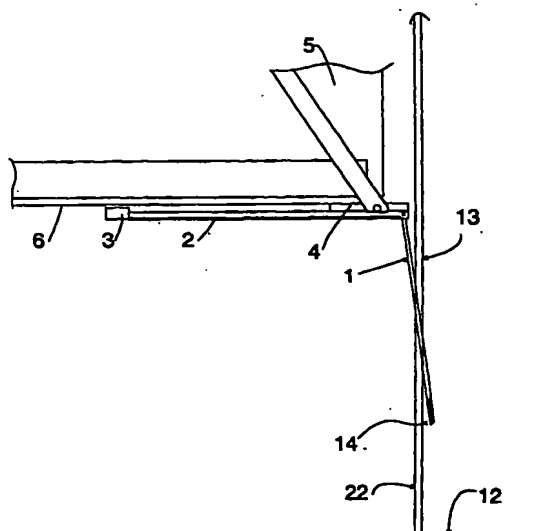


Fig. 1

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Description

[0001] The present invention relates to an apron as defined in the preamble of claim 1, used as a safety device in an elevator.

[0002] When an elevator car is stuck between floors in an elevator shaft, the situation is an emergency in which it is necessary to ensure that passengers will not fall into the elevator shaft when trying to get away to the floor below. When the elevator stops in the shaft between floors, there may remain a large gap between the lower edge of the car and the floor below, in which case it may be difficult for a passenger to get away from the elevator. In prior art, the lower edge of the car is provided with a safety device, a so-called tabular apron, to prevent passengers from falling down into the elevator shaft in a rescue situation. When getting out of the car, passengers can kick themselves off the apron onto the floor below without falling down into the shaft. It is also possible to take advantage of the apron in elevator maintenance work. In prior-art solutions, the apron is always in a position where it extends downward from the car in a direction perpendicular to the car floor. Therefore, it requires a large space below the car when the elevator descends to the lowest floor. If a larger space is to be provided below the elevator car to accommodate the apron, considerable additional costs will be incurred.

[0003] In elevators in which the shaft bottom space is lower than the height of the required apron, the apron cannot be mounted in a fixed upright position throughout its height. In prior art, to solve the problems caused by a low shaft bottom space regarding the apron, e.g. a telescoping metal panel structure has been used, in which case, when the elevator comes to the bottom floor, the panel has to be divided horizontally into a large number of narrow strips. It may be difficult to use if the shaft bottom space is considerably lower than the panel. Another safeguard used in prior art is a metal panel that comes off when the elevator is driven onto the buffer provided on the shaft bottom to stop the elevator when necessary. According to specification US 6095288, a retractable toe guard has been developed for use in an elevator solution with a low shaft bottom space. However, when a telescoping solution is used, there may be the problem that the panel collapses or comes loose when subjected to a vertical force e.g. as a passenger being rescued from the elevator kicks on the panel.

[0004] The object of the invention is to eliminate the above-mentioned drawbacks and to achieve a safety device for use in elevators with a low shaft bottom space.

[0005] As for the features characteristic of the invention, reference is made to the characterization part of claim 1. As for other preferred embodiments of the invention, reference is made to the sub-claims.

[0006] By using an apron according to the invention as a safety device, many advantages will be achieved. When the elevator descends to the bottom floor, the

height of the apron does not constitute an impediment regarding the height of the shaft bottom space. In a preferred case, when the apron is in a horizontal position under the car, it may require as little space in the vertical direction as only 20 mm. The apron is preferably formed from a single panel. During normal operation, the apron is held in a horizontal position under the car. The apron can be easily and readily used in a rescue situation. The apron of the invention can also be utilized in connection with maintenance operations. Associated with the apron is a limit switch placed under the car to give the elevator control system data indicating a normal operational status when the apron is in the horizontal position. The elevator can not start moving accidentally when the apron is in an upright position, thus avoiding "unnecessary" accidents. The apron of the invention can be used to advantage in elevators in which the shaft bottom space is lower than the height of the apron, because the apron is held in a locked position under the car floor during elevator travel. The apron can be easily pulled out along rails mounted below the car floor, and it is easy to lock in position. According to an embodiment of the invention, the front edge of the apron is provided with a beveling that acts as a toe guard at the sill when the apron is in the horizontal position. The toe guard covers the gap at the sill of the elevator. The apron is easy to lock in the upright position. A further advantage is that the apron is in the operating position only when it is needed in a rescue situation.

[0007] In the following, the invention will be described in detail with reference to the attached drawings.

- Fig. 1 presents an apron in operating position.
- Fig. 2 illustrates the structure of the apron in a three-dimensional view.
- Fig. 3 illustrates the locking mechanism of the apron.
- Fig. 4 presents another embodiment of the invention.
- Fig. 5 presents an apron according to Fig. 4.

[0008] Fig. 1 presents a partially sectioned view of an elevator safety device, an apron 1 made of a durable material, such as steel, and consisting of a single panel, mounted below an elevator car 5. The apron can be pulled out along rails 2 fixed to the underside of the car floor 6 and extending to the sill 4 of the car 5. The rails are provided with grooves along which the apron can slide. When passengers are to be rescued from an elevator stuck between floors, rescuers can pull out the apron. Connected to the apron are locking bars 14 (Fig. 3) which engage the door frame 13 when the apron has been pulled out from under the car toward the landing. The apron is pulled out by bringing its end from under

the car from the shaft 22 space into the landing 12 space. When tripped, the locking bars 14 at the end of the apron are pushed outward by the force exerted by springs provided in them, engaging the door jambs 13 and thus preventing the apron from turning toward the shaft space. The front edge of the apron is provided with a beveling 7 which functions as a toe guard covering the gap in front of the door sill 4 when the apron 1 is in the horizontal position. To release the apron 1 after the passengers have been rescued, it is turned to the horizontal position and pushed back under the car 5. The locking bars 14 have to be pushed in first to provide enough room in the width-ways direction of the panel when it is turned back past the door jambs into its position under the car. After this, a limit switch 3 sends the elevator control system data indicating that normal elevator travel between floors is possible.

[0009] Fig. 2 presents a three-dimensional view of the structure of the apron 1. Rails 2 permit the apron 1 to move between the horizontal and upright positions under the car. At the upper edge of the panel 1, an L-shaped bracket 8 is provided at each corner to allow the rails to be fastened to the underside of the car bottom using e.g. screws.

[0010] Fig. 3 shows the locking bars 14 mounted on the apron and designed to hold the panel in an upright position when they engage the door jambs 13. The locking bars are provided with springs 24 pushing the bars outward. When the apron panel is being pulled from under the car, the spring 24 forces the handle 23 to move outward so that it projects out of the apron. Thus they engage the door jambs from the side of the landing and keep the apron in an upright position at a certain angle. After the rescue operation has been finished, the locking bars are pressed by their handles 23 back into the position under the apron and the apron is slid along the rails 2 into the horizontal position under the car.

[0011] Fig. 4 presents another embodiment. The figure shows an apron 15 formed from a single panel. The apron is fastened under the floor of the elevator car by means of a supporting beam 19 provided with locking elements 18 designed to lock the apron in a horizontal position under the car. When the apron is to be brought into an upright position in a rescue situation, one grips the apron by its upper edge 16, thereby releasing it from the locking elements 18, whereupon it descends into an upright position. The apron is provided with supporting bars 20 and a crossbar 21 designed to keep it in an upright position, e.g. in a perpendicular position relative to the car floor. The juncture of the supporting bars 20 and the crossbar 21 is also shown in a magnified view. The supporting bars 20 move relative to each other so that they turn under the car when the apron is returned to the horizontal position. When the apron is being brought into the horizontal position, the junctures 25 between the supporting bars 20 and the crossbar 21 move toward the apron and both the supporting bars 20 and the crossbar 21 assume a horizontal position together with the

apron, whereupon the apron is locked in place by the locking elements 18. The juncture 25 can be moved e.g. by means of a wire going through the apron and connected to the crossbar 21. After the rescue operation, the supporting bars are turned under the car by pulling at the wire and the panel is turned to the horizontal position. Another possibility is to grip the supporting bars 20 by hand and turn them under the car together with the apron.

[0012] Fig. 5 presents an apron 15 as illustrated in Fig. 4 in its position under the car during normal elevator operation. Beam 19 together with beams 17 hold the apron under the car floor.

[0013] It is obvious to the person skilled in the art that different embodiments of the invention are not restricted to the examples described above but may be varied within the scope of the following claims.

Claims

1. Apron for use as a safety device in an elevator, said elevator comprising a landing, an elevator shaft, a car and a car floor, which apron (1) can be disposed under the floor (6) of the car (5) in a position parallel to it for normal operation of the elevator and that the apron (1,15) can be brought into a position substantially perpendicular to the floor (6) of the car (5), **characterized in that** the apron (1) is movable on rails (2) placed below the floor (6) of the car (5).
2. Apron as defined in claim 1, **characterized in that** it consists of a single panel.
3. Apron as defined in claim 1 or 2, **characterized in that** the apron (1) can be pulled out from its position under the car to a position extending into the space over the landing, and that in this situation adjustable locking bars (14) attached to the apron engage the door jambs (13) and the apron remains in an upright position.
4. Apron (1) as defined in claim 1, 2 or 3, **characterized in that** the locking bars (14) can be pushed under the apron and the apron is moved along the rails into a horizontal position.
5. Apron (15) as defined in claim 1 or 2, **characterized in that** the apron (15) is secured under the floor of the car by means of locking elements (18).
6. Apron (15) as defined in claim 1, 2 or 5, **characterized in that** the apron can be pulled by its front edge (16) so that it is released and descends into an upright position.
7. Apron (15) as defined in claim 1, 2 or 6, **characterized in that** the apron is held in an upright position

by supporting bars (20) and a crossbar (21) connected to the apron.

8. Apron (15) as defined in claim 1, 2, 6 or 7 **characterized in that** the supporting bars (20) and the crossbar (21) can be placed together with the apron in a horizontal position under the car. 5
9. Apron as defined in any one of the preceding claims, **characterized in that** the elevator comprises a limit switch (3) which gives the elevator control system data indicating the position of the apron (1, 15). 10
10. Apron as defined in any one of the preceding claims, **characterized in that** the limit switch (3) gives the elevator control system data indicating normal operation when the apron (1, 15) is in the horizontal position. 15
11. Apron as defined in any one of the preceding claims, **characterized in that** the front edge of the apron (1, 15) can be provided with a beveling (7) acting as a toe guard at the sill (4) when the apron (1) is in the horizontal position. 20 25

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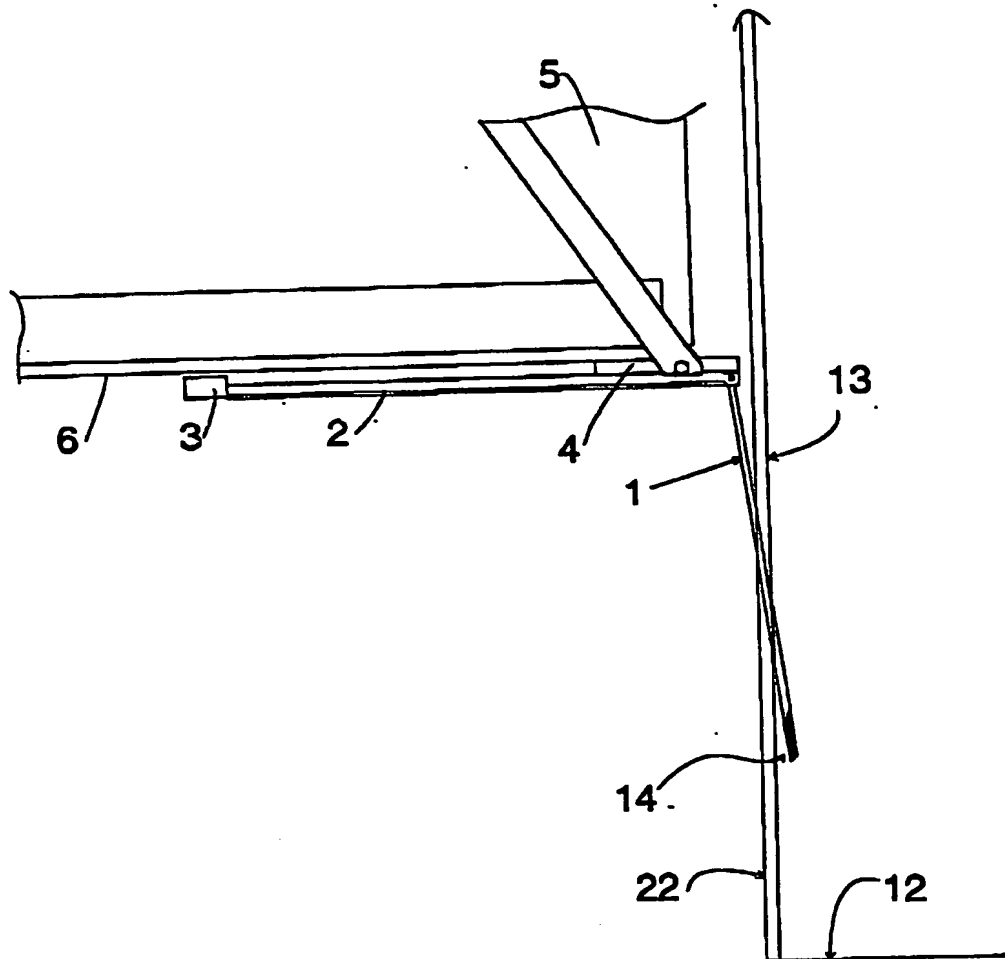


Fig. 1

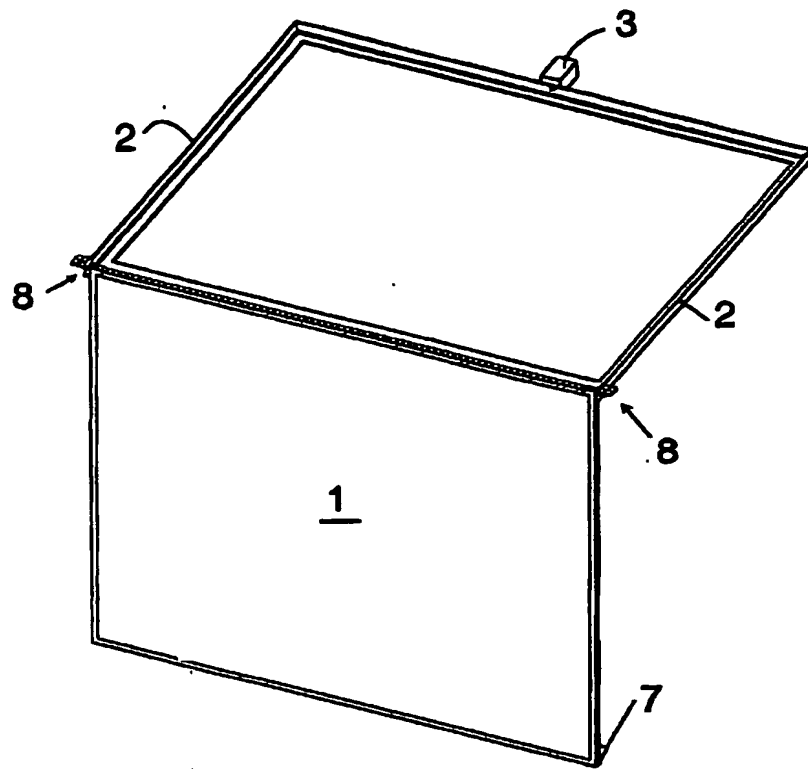


Fig. 2

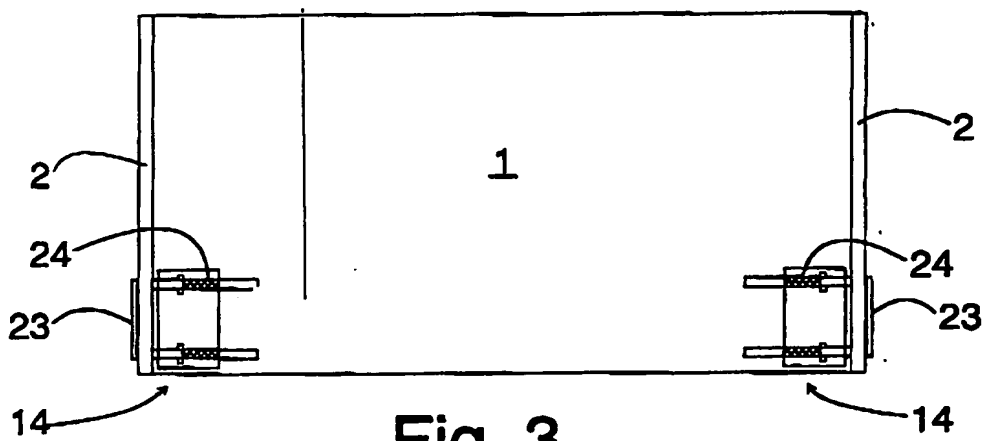
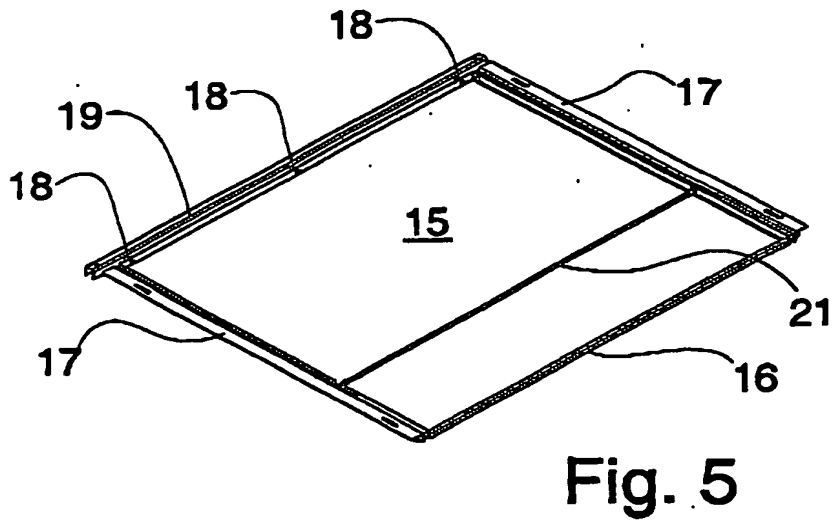
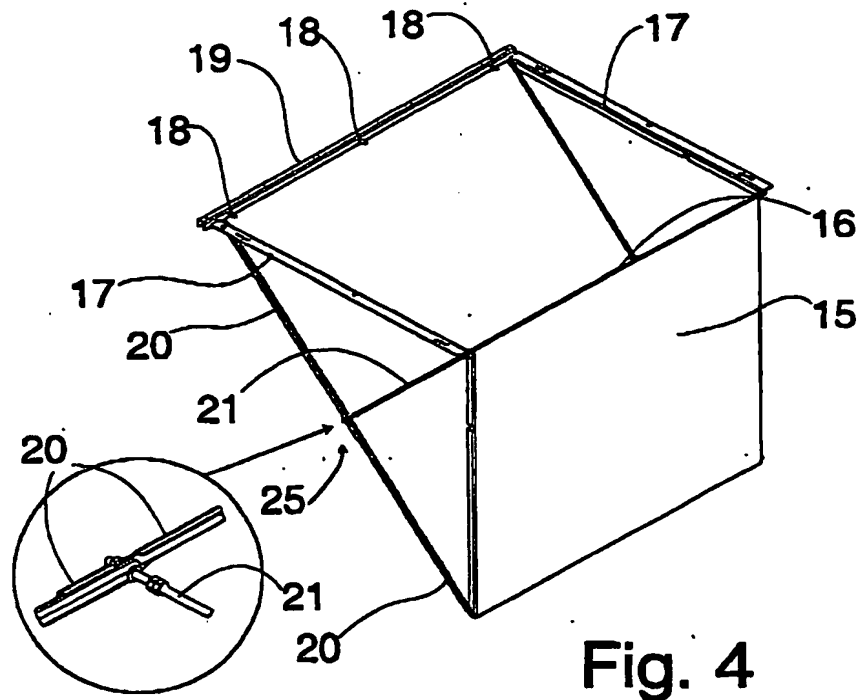
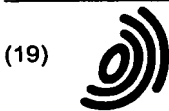


Fig. 3





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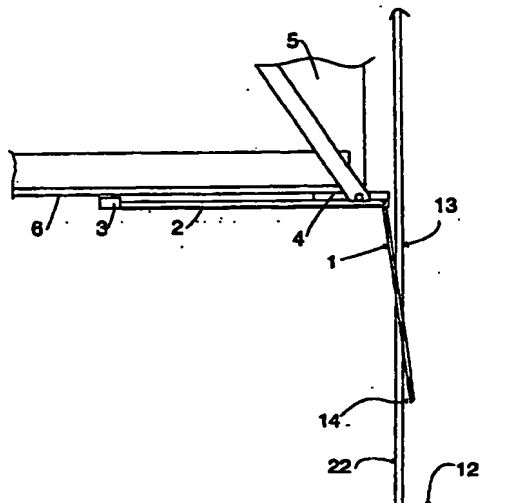


Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 01 12 9853

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
P,X	EP 1 118 576 A (THYSSEN AUFZUGSWERKE/ GMBH) 25 July 2001 (2001-07-25) * abstract * * column 2, line 55 - column 3, line 17 * * column 9, line 30 - line 53 * * figures 1A, 5A, 5B, 5C *	1,2,7-11	B66B13/28 B66B11/02
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B66B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 October 2003	Examiner Salvador, D.
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 01 12 9853

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